

TRANSCRIPTOME AND EXOMETABOLOME ANALYSIS OF THE CELL SIZE-REGULATED SEXUAL REPRODUCTION IN DIATOMS

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Diatoms are the most species-rich group of unicellular eukaryotic algae, characterized by a silica cell wall consisting of two valves which typically overlap one other like the two halves of a petri dish. Diatoms possess a unique cell size reduction-restitution cycle. When a diatom divides to produce two daughter cells, each cell retains one of the two halves and forms a smaller half within it. As a result, the average size of a diatom population decreases at each round of vegetative division. Once the cells reach a threshold cell size, they are able to reconstitute cell size through sexual reproduction (auxosporulation), giving rise to large vegetative cells.

Seminavis robusta has, in contrast to the sequenced diatom species, a well described life cycle in which sexual reproduction can be induced experimentally. As meiosis only occurs in cells below the sexual cell size threshold, differences in gene expression in large and small cells are expected, induced by a hitherto unknown cell size sensor once the critical threshold has been reached. This gene expression possibly results in the secretion of products to sense the presence of compatible mating partners, as small cells show directed movement towards small cells of the opposite mating type.

Here we demonstrate differential gene expression and metabolite excretion using cDNA-AFLP transcriptome analysis and UPLC-MS exometabolome analysis, respectively. The identified genes, which are now known to be involved in the cell size-induced sexual sensitivity, will be further explored and will lead to a better understanding of the molecular mechanisms regulating this unique coupling of cell size and sexual reproduction in diatoms.

References

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